NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document identifier on subsequent pages has not been changed, but will be changed the next time this document is revised.

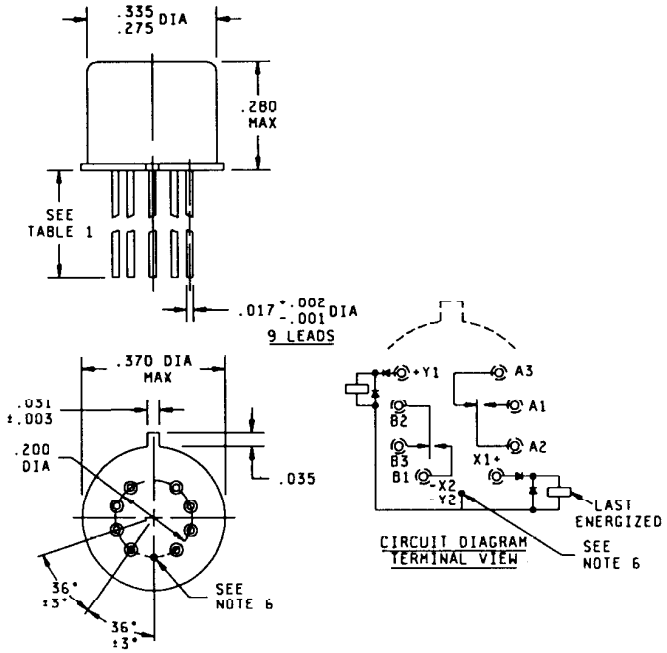
MIL-PRF-39016/30E
20 JULY 1988
SUPERSEDING
MIL-R-39016/30D
10 February 1984

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE (LATCHING) WITH INTERNAL DIODES FOR COIL TRANSIENT SUPPRESSION AND POLARITY REVERSAL PROTECTION

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification and the latest issue of MIL-R-39016.

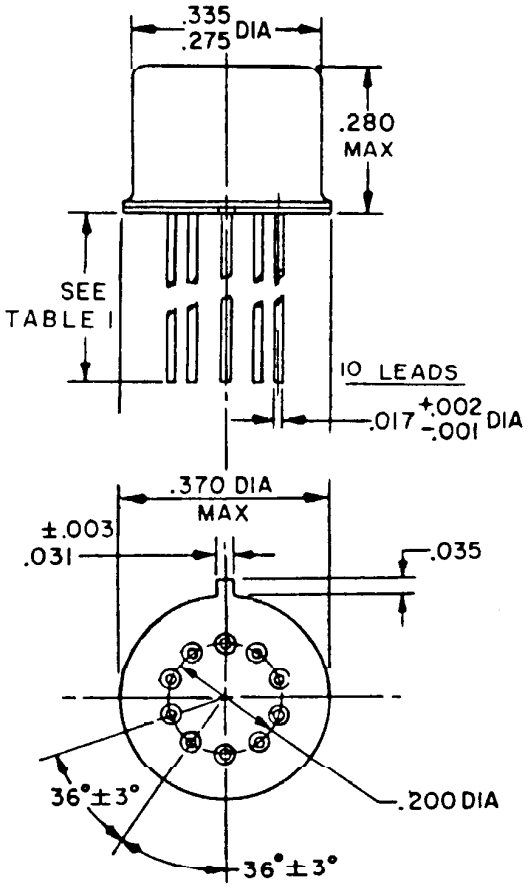


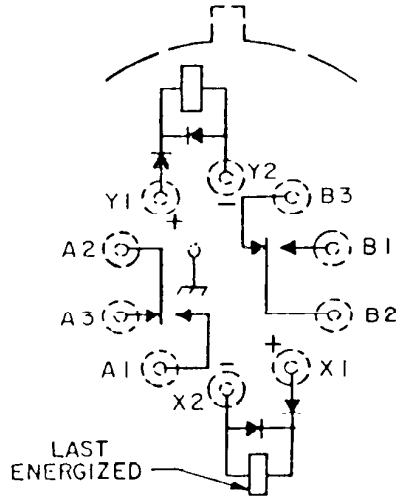
Inches	mm	Inches	mm	Inches	mm
.001	0.03	.031	0.79	.280	7.11
.002	0.05	.035	0.89	.335	8.51
.003	0.08	.200	5.09	.370	9.40
.017	0.43	.275	6.99		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above are for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case, except for lead terminal, -X2 -Y2, which is grounded to the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.

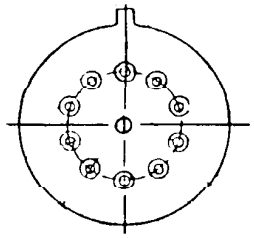
FIGURE 1. Dimensions and configuration.

(E) denotes changes

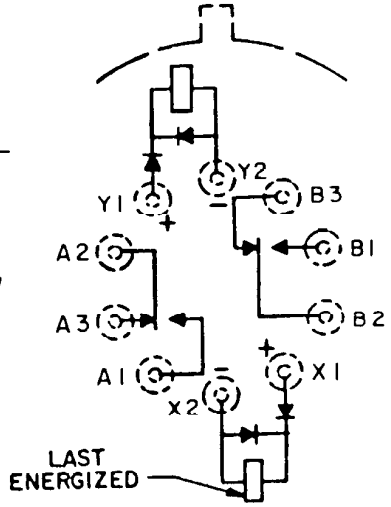




CIRCUIT DIAGRAM
TERMINAL VIEW (-073 THRU-078)



TERMINAL VIEW
-073 THRU -078
(SEE NOTE 9)

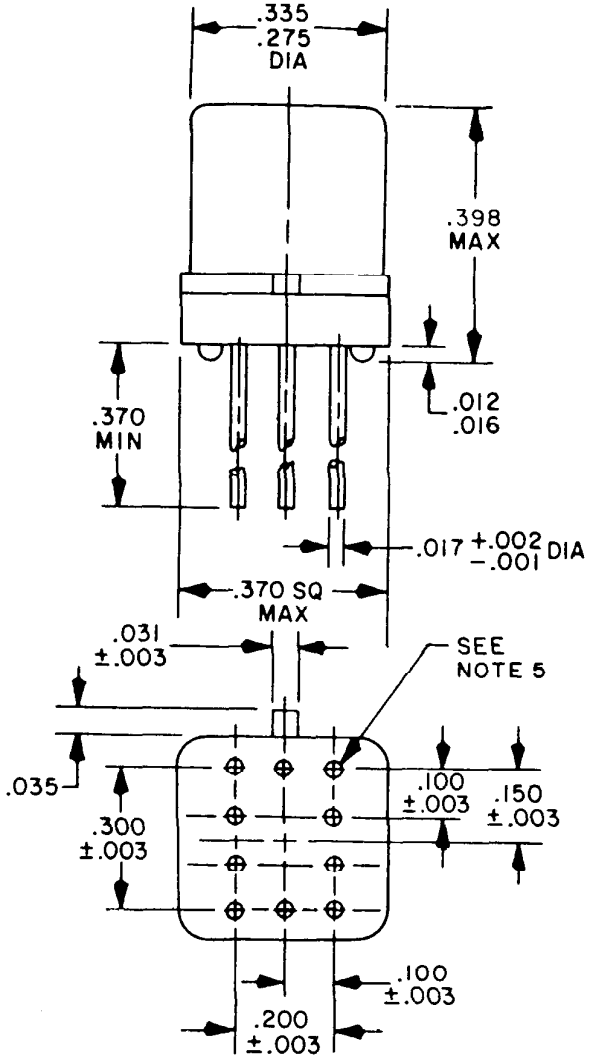


CIRCUIT DIAGRAM
TERMINAL VIEW

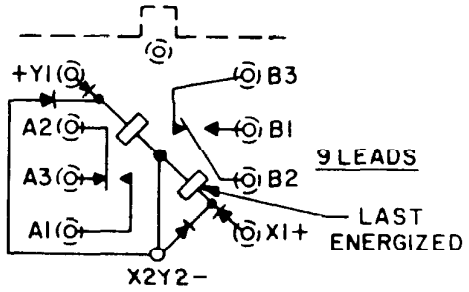
Inches	mm	Inches	mm	Inches	mm
.001	0.03	.031	0.79	.275	6.99
.002	0.05	.035	0.89	.280	7.11
.003	0.08	.200	5.08	.335	8.51
.017	0.43			.370	9.40

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.
9. M39016/30-073 through M39016/30-078 shall be supplied with a case grounding pin welded to the relay header as shown.

Ⓔ FIGURE 2. Dimensions and configuration.

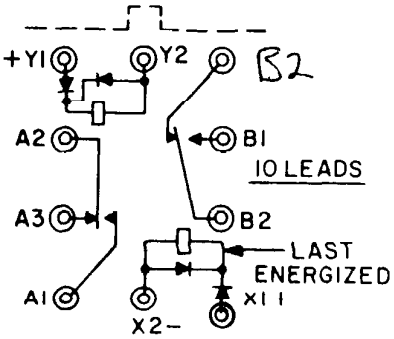


INCHES	MM
.001	0.03
.002	0.05
.003	0.08
.012	0.30
.016	0.41
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.150	3.81
.200	5.08
.275	6.99
.300	7.62
.335	8.51
.370	9.40
.398	10.11



CIRCUIT DIAGRAM 1

TERMINAL VIEW APPLICABLE
TO DASH NUMBERS -061 THRU -066
(SEE NOTE 9) Ⓔ



CIRCUIT DIAGRAM 2

TERMINAL VIEW APPLICABLE
TO DASH NUMBERS -067 THRU -072

Ⓔ

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Spreader pads shall be certified to MIL-M-38527/5-03.
5. Dimensions and tolerances shown for the bottom view of the spreader pad are for the center to center locations of the holes in the spreader pad.
6. Shape optional within the envelope dimension.
7. Terminal numbers shown above for reference only. Numbers do not appear on the relay.
8. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
9. All leads shall be electrically insulated from the case.
10. Coil symbol optional in accordance with MIL-STD-1285.
11. Circuit diagram shown on part is the terminal view.

FIGURE 3. Dimensions and configuration relay with spreader pad attached.

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive:
1.0 ampere at 28 V dc.
500 milliamperes at 115 V ac 400 Hz case not grounded.
250 milliamperes at 115 V ac 60 Hz case not grounded.
100 milliamperes at 115 V ac 60 and 400 Hz case grounded.
Inductive load: 0.2 ampere at 28 V dc with 0.32 henry inductance.
Lamp: 0.10 ampere at 28 V dc.

Low level: 10 to 50 µA at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

(E) Initial: 0.125 ohm maximum (0.150 ohm maximum with spreader pads attached).

High level:

During life: Not more than 5 percent of open circuit voltage.
(E) After life: 0.225 ohm maximum (0.250 ohm maximum with spreader pad attached).

Low level:

During life: 33 ohms maximum.
(E) After life: 0.175 ohm maximum (0.200 ohm maximum with spreader pad attached).

Intermediate current:

During: 1 ohm maximum.
(E) After: 0.225 ohm maximum (0.250 ohm maximum with spreader pad attached).

Contact bounce: 2 milliseconds maximum (applicable to failure rate level "L").

Contact stabilization time: 2.5 milliseconds maximum (applicable to failure rate levels "M", "P", and "R").

Overload (high level only): Two times rated current.

(E) Neutral screen: Applicable.

COIL DATA: See table I.

Operate time: 2.0 ms maximum over temperature range with rated coil voltage.
Release time: Not applicable.

ELECTRICAL DATA: 1/ 2/

Insulation resistance: 10,000 megohms minimum at 500 V dc, except the resistance between coil and case at high temperature shall be 1,000 megohms minimum.

1/ Insulation resistance and dielectric withstanding voltage tests must always precede all other specified electrical measurements. Connect all coil terminals together to avoid damage to diodes.
2/ Dielectric withstanding voltage and insulation resistance are not applicable between coils and case or from coil to coil on figure 1 relays.

Dielectric withstanding voltage:

	Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame, or enclosure and all contacts both in the energized and deenergized positions	500	125 All terminals to case
Between case, frame, or enclosure and coils	500	
Between all contacts and coils	500	
Between open contacts in the energized and deenergized positions	500	
Between contact poles	500	
(E) Between coils (applicable to 10 and 11 lead relays)	500	

DIODE CHARACTERISTICS: 3/

Maximum transient voltage: 1 volt.

(E) Breakdown voltage: 100 V dc minimum at 10 microamperes (μA).

Maximum leakage current: 1 μA at 50 V dc.

(E) Coil transient suppression: Applicable.

(E) Semiconductor in process screening: Applicable, visual inspection of semiconductors shall be accordance with MIL-STD-750 method 2073.

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

(E) Vibration (sinusoidal): MIL-STD-202, method 204. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts.

(E) Vibration (random): MIL-STD-202, method 214, test condition IG. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contact (Applicable to qualification and group C testing only).

(E) Shock (specified pulse): MIL-STD-202, method 213, test condition B (75 G's). Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts.

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

Salt atmosphere (corrosion): In accordance with method 1041, MIL-STD-750.

PHYSICAL DATA:

Terminal strength (Method 211, MIL-STD-202):

Pull test: Test condition A, 1 pound pull.
Bend test: Test condition C, 1/2 pound load.
(E) Twist test: Test condition D as specified in MIL-R-39016.

Solderability: Applicable.

(E) 3/ In all tables relating to qualification and group A testing, delete coil resistance and substitute the following test:

a. Diode breakdown and block integrity:
With applicable voltage applied to the relay coil circuit in the reverse direction, monitor leakage current with dc microammeter or oscilloscope or qualifying activity approved test equipment. Leakage current shall not exceed the specified value.

Dimensions and configuration: See figures 1, 2, and 3.

Weight: 2.84 grams (0.10 ounce) maximum, 3.09 grams (0.109 ounce) maximum with spreader pad attached.

Seal: Hermetic.

(E) Minimum marking: Military part number, "J" with the date code (example J8530), circuit diagram, and manufacturer's name or source code.

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles per relay.
(E) Low level: 100,000 cycles plus 900,000 cycles mechanical life.

PART NUMBER: M39016/30- (dash number from table I and suffix letter designating failure rate level).

(E) TABLE I. Dash numbers and characteristics. 1/ 2/

Dash numbers 3/						Coil voltge V dc 6/		At 25°C			Over temp range
Lead length 1.500 min 4/	Lead length .187 ±.010	Lead length .500 min	Spreader pad (fig 3) 5/	.500 Min with ground pin 8/	Number of leads	Rated	Max	Coil resistance ohms (Ref only) 7/	Coil circuit current 6/ (mA) Max	Coil circuit current 6/ (mA) Min	Specified pickup (latch/ reset) value (voltage) (V dc)	Specified pickup (latch/ reset) value (voltage) (V dc)
025	037	049	061	---	9	6.0	8.0	97	63.0	46.9	4.1	5.5
026	038	050	062	---	9	9.0	12	280	33.7	26.0	6.3	7.8
027	039	051	063	---	9	12	16	500	25.5	20.0	8.0	10
028	040	052	064	---	9	18	24	1,130	17.2	13.7	11.6	14.5
029	041	053	065	---	9	26.5	32	2,000	14.4	11.6	15.4	19
030	042	054	066	---	9	5.0	6.0	48	104.2	75.8	3.5	4.5
031	043	055	067	---	10	5.0	6.0	48	104.2	75.8	3.5	4.5
032	044	056	068	---	10	6.0	8.0	97	63.0	46.9	4.1	5.5
033	045	057	069	---	10	9.0	12	280	33.7	26.0	6.3	7.8
034	046	058	070	---	10	12	16	500	25.5	20.0	8.0	10
035	047	059	071	---	10	18	24	1,130	17.2	13.7	11.6	14.5
036	048	060	072	---	10	26.5	32	2,000	14.4	11.6	15.4	19
---	---	---	---	073	11	12	16	48	104.2	75.8	3.5	4.5
---	---	---	---	074	11	5.0	6.0	97	63.0	46.9	4.1	5.5
---	---	---	---	075	11	6.0	8.0	280	33.7	26.0	6.3	7.8
---	---	---	---	076	11	9.0	12	500	25.5	20.0	8.0	10
---	---	---	---	077	11	18	24	1,130	17.2	13.7	11.6	14.5
---	---	---	---	078	11	26.5	32	2,000	14.4	11.0	15.4	19

1/ Each relay possesses high level and low level capabilities. However, relays previously tested or used above 10 mA resistive at 6 V dc maximum or peak ac open circuits not recommended for subsequent use in low level applications.

2/ WARNING: When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less than the nominal coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed, it is possible for the relay to be in the magnetically neutral position.

3/ The suffix letter L, M, P, or R to designate the applicable failure rate level shall be added to the applicable listed dash number. Failure rate level (percent per 10,000 cycles): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example, 025L - - - - 072R.

4/ 1.500 leads are inactive for new design.

5/ Relays supplied with spreader pads (-061 through -072) shall have the pads rigidly attached.

6/ CAUTON: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.

7/ Coil resistance not directly measurable at relay terminals. When rated voltage is applied to coil terminals, the coil circuit must be within the limits shown. Measure at 25°C at nominal voltage for 5 seconds maximum.

8/ Relays are supplied with a case grounding pin welded to the header (see figure 2).

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

Ⓔ TABLE II. Qualification inspection and sample size. 1/

Single submission	Group submission	
18 units plus 1 open unit for level L at C = 0 1/ 33 units plus 1 open unit for level M at C = 0 1/ Qualification inspection as applicable	M39016/30-053	18 units plus 1 open unit for level L at C = 0 1/ 33 units plus 1 open unit for level M at C = 0 1/ Qualification inspection as applicable
	M39016/30-049 M39016/30-050 M39016/30-051 M39016/30-052 M39016/30-054 M39016/30-055 M39016/30-056 M39016/30-057 M39016/30-058 M39016/30-059 M39016/30-060	2 units each part number Qualification inspection, group II
	M39016/30-078	1 unit terminal strength and terminal solderability

1/ The number of units required for qualification testing shall be increased as required in group V, table II, MIL-R-39016, if the relay manufacturer elects to test the number of units permitting one or more failures. Prior to performance of qualification inspection testing; the relay manufacturer shall preselect the sampling plan.

Initial qualification of relays supplied with spreader pads (-061 through -072) shall be tested as specified below:

Perform the following tests as specified in the qualification inspection table of MIL-R-39016, in the order shown below:

Ⓔ Before installation of pad: screening, visual and mechanical examination (internal), thermal shock, resistance to solvents, vibration (sinusoidal), vibration (random), shock (specified pulse), acceleration, terminal strength, magnetic interference (when specified), capacitance (when specified), coil life (applicable to continuous duty relays only), resistance to soldering heat, salt spray (corrosion), overload (applicable to high level relays only), life, terminal strength, and intermediate current.

After installation of pad perform the following tests as specified in the qualification inspection table of MIL-R-39016, in the order shown below:

Ⓔ Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup (latch/reset) value (voltage) coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader pads (-061 through -072), two units of the 26.5 volt rated coil voltage (-065) shall be tested as specified below:

Before installation of pad perform the following tests as specified in the qualification inspection table of MIL-R-39016 in the following order:

(E) For failure rate level L only. Screening.
For failure rate levels M, P, and R: Vibration (sinusoidal) test duration shall be 10 minutes, vibration (random), particle impact noise detection (P.I.N.D., when specified), screening.

After installation of pad perform the following tests as specified in the qualification inspection table of MIL-R-39016 in the order shown below:

(E) Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup latch/reset) value (voltage), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

(E) Group A testing for relays supplied with spreader pads (-061 through -072) shall be tested as specified below:

Before installation of pad perform subgroup 2 of group A tests.
After installation of pad perform subgroups 3 and 4 of group A tests.

SUPERSESSION DATA:

Supersession data: See table III.

TABLE III. Supersession data. 1/

Superseded part no. M39016/30-	New part no. M39016/30-	Superseded part no. M39016/30-	New part no. M39016/30-
001	025	013	031
002	026	014	032
003	027	015	033
004	028	016	034
005	029	017	035
006	037	018	036
007	038	019	043
008	039	020	044
009	040	021	045
010	041	022	046
011	030	023	047
012	042	024	048

1/ Dash numbers -025 through -036 are inactive for new design and are for support of existing equipment designs only.

Cross reference for Government logistical support: See table IV.

(E) TABLE IV. Cross reference for Government logistical support.

Superseded part number M39016/30-	New part number M39016/30-	Support with part number M39016/30-	New part number M39016/30-	Support with part number M39016/30-	New part number M39016/30-	Support with part number M39016/30-
001	025	025	049	049	073	073
002	026	026	050	050	074	074
003	027	027	051	051	075	075
004	028	028	052	052	076	075
005	029	029	053	053	077	077
006	037	049	054	054	078	078
007	038	050	055	055		
008	039	051	056	056		
009	040	052	057	057		
010	041	053	058	058		
011	030	030	059	059		
012	042	054	060	060		
013	031	031	061	061		
014	032	032	062	062		
015	033	033	063	063		
016	034	034	064	064		
017	035	035	065	065		
018	036	036	066	066		
019	043	055	067	067		
020	044	056	068	068		
021	045	057	069	069		
022	046	058	070	070		
023	047	059	071	071		
024	048	060	072	072		

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
(E) Air Force - 85

Review activities:
Army - AL, AR, AT, MI
Navy - OS, SH,
(E) Air Force - 99
DLA - ES

User activities:
Army - AV, ME
Navy - AS, MC
(E) Air Force - 11, 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5945-0757-24)